

**Notice of Allowability**

Application No.

10/542,545

Examiner

Henry S. Hu

Applicant(s)

NISHIMURA ET AL.

Art Unit

1796

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Amendment of October 29, 2007.
2. ☒ The allowed claim(s) is/are 1-6.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some\* c) ☐ None of the:
- ☒ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |  |   |
|--|---|
| 1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 5. <input type="checkbox"/> Notice of Informal Patent Application                     |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 6. <input type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date _____ |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br>Paper No./Mail Date _____    | 7. <input type="checkbox"/> Examiner's Amendment/Comment                              |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance  |
|  | 9. <input type="checkbox"/> Other _____   |

## DETAILED ACTION

1. This Office Action is in response to **Amendment** filed on October 29, 2007. **Claims 1-6 were amended; non-elected Claims 7-9 (Group II) were cancelled**, while no new claim was added. To be specific, parent **Claim 1** was amended in three ways including: (A) to make only the fluoroelastomer which is vulcanizable by peroxide vulcanization, (B) to correct the use of monomer so as to overcome claim objection, and (C) the copolymerization is achieved in the presence of water, an emulsifier and a compound of  $R_f^1(I_x)$ . Dependent **Claim 5** was amended to have the proper Markush language so as to overcome 112-2<sup>nd</sup> claim rejection. Dependent **Claims 2-6** are amended to have the same vulcanizable fluoroelastomer accordingly.

Examiner thereby withdraws 112-2<sup>nd</sup> claim rejection and claim objection in the previous Non-Final Office Action dated July 27, 2007. **Claims 1-6** with only one independent claim (**Claim 1**) are now pending. An action follows.

2. Claim rejections under **Non-Final** Office Action filed on July 27, 2007 are now removed for the reasons given in paragraphs 3-11 thereafter.

### *Allowable Subject Matter*

3. Claims 1-6 are allowed.

4. The following is an examiner's statement of reasons for allowance: The above Claims

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1-6 are allowed over the closest references:

5. The limitation of amended parent Claim 1 in present invention relates to a process for preparing a fluorine-containing elastomer vulcanizable by peroxide vulcanization, which is a batch copolymerization process conducted under conditions of reduced temperature of at least 0.95 and reduced pressure of at least 0.80 of the critical constant calculated from critical temperature, critical pressure and composition ratio of each monomer in the gaseous phase of the reaction vessel using the Peng-Robinson formula as specified,

wherein monomers comprising at least one fluoroolefin are copolymerized in the presence of water, an emulsifier and a compound having the formula:  $Rf^d(I)_x$  with all the factors as specified.

See other limitations of dependent Claims 2-6.

6. Applicants have now claimed in twice-amended parent Claim 1 an unexpected way of obtaining a fluorinated “copolymeric elastomer” in a high productivity comparable to that of non-iodine transfer polymerization process in the course of carrying out an iodine transfer polymerization at high pressure (see abstract at lines 1-4). The process is a batch copolymerization process specifically involved performing the copolymerization under “reduced temperature of at least 0.95” and “reduced pressure of at least 0.80” of the critical constant calculated from “Peng-Robinson formula” as specified (also see Applicants’ arguments on pages 6-13 of Remarks). The key point is that currently amended copolymerization is limited to an emulsion polymerization, which can be only achieved in the

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presence of water, an emulsifier and a compound having the formula:  $Rf^I(I)_x$  with all the factors as specified.

7. Applicants have detailed the selection of polymerization temperature and polymerization pressure in order to satisfy the above-mentioned condition using Peng-Robinson formula. Applicants also show the advantages (unexpected results) for the final product when the conditions are met (see page 7 of Remarks). In order to satisfy condition, the pressures calculated from multiplying critical pressures calculating by Peng-Robinson formula need to be less than polymerization pressure, while the temperatures calculated from multiplying critical temperatures calculating by Peng-Robinson formula need to be less than polymerization temperature. For instance, in order to satisfy the pressure condition according to the present invention, a calculated pressure which is converted by the lower limit of reduced pressure 0.80 has to be lower than a practical polymerization pressure.

8. Regarding parent Claim 1, each of three references including Carlson, Saito and Kitaichi may have disclosed a "batchwise" polymerization process for making fluoropolymers by using reduced temperature and reduced pressure, wherein the copolymerization is achieved in the presence of an iodine-containing compound having within the claimed formula:  $Rf^I(I)_x$ , which is known in the art to be useful as chain transfer agent. However, with Applicants' detailed calculations on pages 10-12 of Remarks, none of the three references describes or suggests the above-mentioned condition. To be specific,

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see page 10 at line 4-5 and page 11 at lines 3-7 for Carlson's emulsion polymerization, see page 12 at lines 12-14 for Kitaichi's emulsion polymerization, while see page 11 at lines 14-19 for Saito where only bulk polymerization is performed. According to the art, Saito's copolymerization is not emulsion polymerization at all since emulsion polymerization requires the presence of water and an emulsifier.

9. It is noted by this Examiner that even reduced temperature and reduced pressure are able to apply to emulsion copolymerization vessel, the pressures calculated from multiplying critical pressures calculating by Peng-Robinson formula may be still NOT less than polymerization pressure, while the temperatures calculated from multiplying critical temperatures calculating by Peng-Robinson formula may be still NOT less than polymerization temperature.

Therefore, all the three references including **Carlson, Saito and Kitaichi** in combination or alone cannot teach or suggest the claimed “**emulsion copolymerization process when water, an emulsifier and an iodine-containing compound such as  $Rf^I(I)_x$  are present**”.

10. After further examination and search, the examiner found the following prior art did not teach the claimed limitation:

Each of **US 6,806,332 B2 to Royer et al.** and **US 6,914,105 B1 to Charpentier et al.** only discloses the preparation of continuous copolymerization in carbon dioxide medium (see abstract and title). **Peng-Robinson formula has been briefly mentioned** (see “105” at

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column 14, line 57-58; see "332" at column 17, line 58-59). Although fluorinated monomers are involved (see "105" at column 6, line 27-32; see "332" at column 5, line 57-62), the process is NOT a batchwise polymerization. Additionally, iodine-containing compound is NOT used or suggested.

11. The key issue on emulsion copolymerization to make a fluorinated "copolymeric elastomer" in a high productivity comparable to that of non-iodine transfer polymerization process in the course of carrying out an iodine transfer polymerization at high pressure, the above-mentioned pressure and temperature cannot be overcome by any or the combination of the above references, therefore, the present invention is novel.

12. As of the date of this office action, the examiner has not located or identified any reference that can be used singularly or in combination with another reference including the above references to render the present invention anticipated or obvious to one of the ordinary skill in the art. Therefore, the independent and parent process **Claim 1** is allowed for the reason listed above. Since the prior art of record fails to teach the present invention, the remaining pending dependent **Claims 2-6** are passed to issue.

13. Any inquiry concerning this communication or earlier communication from the examiner should be directed to **Dr. Henry S. Hu** whose telephone number is (571) 272-1103. The examiner can be reached on Monday through Friday from 9:00 AM – 5:00 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vasu Jagannathan, can be reached on (571) 272-1119. The fax number for the organization where this application or proceeding is assigned is (571) 273-8300 for all regular communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Peter D. Mulcahy/  
Peter D. Mulcahy  
Primary Examiner  
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Henry S. Hu

Patent Examiner, Art Unit 1796, USPTO

January 21, 2008